Geology

Unit - I: Physical Geology, Remote Sensing and Structural Geology

- 1. Internal structure and composition of Earth; Origin of Earth, Weathering and Erosion; Geological action of River, Wind and Glacier and their landforms; Physiography of India; Application of geomorphology.
- 2. Theory of Isostasy, Continental drift, Plate tectonics, Mid-Oceanic Ridges, Island arc.
- 3. Principles of Aerial Photography; Satellite Remote Sensing Data products, their interpretation and application; Geographic Information System (GIS) Principles and application.
- Concept of stress, strain and rock deformation; Attitude of beds, Classification and mechanism of folds, joints, faults; Lineation and Foliation; Types of Unconformities.

Unit - II: Mineralogy and Petrology

- 1. Crystallography: Six systems (Normal Class); Structural classification of silicates; Physical, chemical and optical characteristics of common rock forming silicate mineral groups (Garnet, Olivine, Pyroxene, Amphibole, Mica, Feldspar, Feldspathoid, and Quartz); Minerals of Carbonate, Phosphate and sulphide groups; Atomic substitution, isomorphism, polymorphism; X-Ray analysis of crystal structures.
- Form, texture, structure and classification of igneous rocks; Binary (Eutectic, Soild Solution) and Ternary phase diagrams; Magmatic differentiation, assimilation;
- **3.** Sedimentary structures and textures; Provenance and diagenesis. Sedimentary environment and facies. Classification of sedimentary rocks. Heavy minerals and their significance; Sedimentary basins of India.
- 4. Texture and structure of metamorphic rocks, regional and contact metamorphism of argillaceous, basic and calcareous rocks. Characteristics of different grades and facies of metamorphism. Metasomatism, granitisation and paired metamorphic belts.
- 5. Petrography of Granites, Basalts, Dunite, Anorthosites, Gabbro, Peridodite, Quartzite, Marble, Khondalite, Charnockite, Sandstone, Conglomerate, Limestone.

Unit -III: Economic Geology

- 1. Classification of mineral deposits, Process of formation of mineral deposits; magmatic, hydrothermal (cavity filling and replacement), oxidation and supergene enrichment, sedimentary exhalation (SEDEX) processes; mechanical and residual concentration; Metallogenic epochs and provinces.
- 2. Geophysical exploration: gravity, electrical, magnetic and seismic; Geological and Geochemical exploration; Controls of ore localization, Mineral beneficiation, Drilling and Mining. Conservation of minerals, Strategic, Critical and Essential minerals.
- 3. Mineralogy, mode of occurrence and distribution of Iron, Manganese, Aluminum, Chromite, Base metals and Gold.
- 4. Indian deposits of mica, asbestos, graphite, beach placer, gemstones, lime stones, gypsum;
- 5. Coal and Petroleum deposits: Their occurrence, genesis and Indian distribution.

Unit - IV: Stratigraphy and Paleontology

- 1. Geological Time Scale, Principles of Stratigraphy, Stratigraphic correlation, Code of Stratigraphic nomenclature;
- 2. Precambrian Stratigraphy: Dharwars, Eastern Ghats, Iron Ore Group, Sausar Group, Aravallis, Cuddapahs and Vindhyans;
- 3. Detailed study of type area of Triassic of Spiti; Jurassic of Kutch; Cretaceous of Trichinopoly, Tertiary of Assam and Siwaliks; Gondwana Super Group; Deccan Traps; Geology of Odisha.
- 4. Study of morphology, classification and evolution of Brachiopods, Lamellibranchs, Gastropods, Cephalopods, Trilobites, Echinoids, Corals and Graptolites;
- 5. Elementary idea on Paleobotany and Palynology, Gondwana flora and its significance;
- 6. Types of microfossils; Study of morphology and classification of foraminifers and Ostracods.
- 7. Evolution of horse and man;

<u>Unit - V: Geochemistry, Environmental Geology, Engineering Geology, Hydrogeology, and Marine Geology</u>

- 1. Cosmic abundance of the elements, Primary geochemical differentiation of the earth, Geochemical classification of elements, Geochemical cycle, Meteorites
- 2. Natural hazards and their mitigation measures-floods, landslides, earthquakes, tsunami, coastal erosion.
- 3. Impact assessment of anthropogenic activities: opencast mining, river valley projects; solid and radioactive waste disposal; excess withdrawal of groundwater, oil spill; concept of global warming, sea level rise.
- 4. Engineering properties of rocks and soil; geological investigation for dams, reservoirs and Tunnels.
- 5. Vertical distribution of groundwater, classification of aquifers, hydrologic cycle; Hydrological properties, Darcy's law and its application; Groundwater quality and contamination; groundwater recharge, rainwater harvesting; Groundwater provinces of India and Odisha.
- 6. Relief of Ocean floor, Marine Sediments, Marine mineral resources.